# Atmospheric pressure

From Wikipedia, the free encyclopedia.

Main Page
Recent changes
Random page
Current events

**Edit this page**
Discuss this page
Page history
What links here
Related changes

Special pages
Bug reports

**Atmospheric pressure** is the pressure caused by the weight of air above any area in the Earth's atmosphere. **Standard atmospheric pressure (atm)** is discussed in the next section.

Air masses are affected by the general atmospheric pressure within the mass, creating areas of high and low pressure.

As elevation increases, fewer air molecules are present. Therefore, atmospheric pressure always decreases with increasing height according to the following relationshi (only a first-order approximation):

$$\log_{10} P \approx 5 - \frac{H}{15500},$$

where *P* is the pressure in pascals and *H* the height in metres. This shows that the pressure at an altitude of 31 km is about 1% of that at sea level. [Source: US Department of Defense Military Standard 810E]

A column of air, 1 square inch in cross section, measured from sea level to the top of th atmosphere would weigh approximately 14.7 lb. A 1 $m^2$ column of air would weigh abou 10 tonnes.

## Standard atmospheric pressure

**Standard atmospheric pressure** or "the **standard atmosphere**" (**1 atm**) is defined as 101,325 pascals. (see also Standard temperature and pressure)

This can also be stated as:

- 29.92 inches or 760 mm of mercury (760 torr)
- 1013.25 millibars (mb)
- 14.7 psia or 0 psig

This "standard pressure" is a purely arbitrary representative value for pressure at sea level, and real atmospheric pressures vary from place to place and moment to moment everywhere in the world.

In a *low atmospheric pressure system* the atmospheric pressure of the air mass is lowe than that of the surrounding air. Low atmospheric pressure systems are symbolized by an **L** on a weather map and are associated with areas of storminess and precipitation. Wind movement is cyclonic around a low pressure system and cold fronts and warm fronts are generally connected to them.

In a *high atmospheric pressure system* the atmospheric pressure of the air mass is higher than that of the surrounding air. High atmospheric pressure systems are

symbolized by an **H** on a weather map and are associated with areas of clear weather.

It is possible to demonstrate atmospheric pressure in a classroom or home environmen using the crushing can experiment. See Atmospheric pressure demo

## External Links

- *An Exercise in Air Pressure*. A lesson plan that deals with understanding atmospheric pressure.

Home

Osmotic Blister Repair

Collision Repair

Services

Testimonials

Custom Fabrication

Links

Customer Inquiry Form

What's New

Contact Us

Credits

# OSMOTIC BLISTER REPAIR

## THE PROBLEM

If boat hulls spent most of their lives in air rather than water, the Water Soluble Materials (WSM), which composes them, would be saved from the blight of blisters. However, the majority of vessels are simply not adaptable to high and dry storage facilities. So, understanding how water permeates a hull is crucial to grasping the osmotic process.

Hydrolysis is the ability of water to break down and alter the chemical bonds of polyester resins. It is through permeation that water comes into contact with WSMs suspended in the laminate layers. *Professional Boat Builders Magazine* in its February 1992 issue lists several known WSMs: MEKP, Silica compounds, PVA, styrene, and the binders in chopped strand matt, just to name a few. It was further noted that a reaction of the water and WSMs left behind a corrosive material, which created 'fiber whiting'. Fiber whiting occurs when resin surrounding the fiber has been hydrolyzed or has totally dissipated. In many older vessels you may only see crazing or cracking of the gelcote. You may never see a blister. In this scenario, the gases created by water reacting with WSMs simply escape through the lesions in the gelcote.

A blister forms when the permeation of water into the laminate exceeds the flow of hydrolyzed fluid trying to escape. The solution, now increased in molecular size, cannot readily pass through the laminate structure. The WSMs are hydroscopic and this absorbing capability attracts more fluid into the same void. It is the continuous attraction of the additional WSMs and their chemical reaction in a limited space, which creates the blister. This usually occurs more rapidly in gelcote with a tight molecular structure. The accumulation of a large number of blisters will, in turn,

create a serious hull delamination. The degree of structural damage will increase as the blisters fracture and penetrate deeper into the layers of the hull.

**THE SOLUTION**

Osprey Marine Composites, Inc. always begins the blister repair process with a laminate profile. The profile consists of four steps. First, high-speed grinders remove a sample of material at selected sites. Second, depth calipers record the thickness of each layer that is removed. Third, a moisture meter determines the amount of moisture in each layer. Fourth, a Barcol Impressor determines the amount of resin deterioration. This information determines the repair procedure, i.e. how much material has been damaged and must be removed and replaced with new material.

The next step is to remove the damaged material. The hydraulic peeler is set to the appropriate depth, and the damaged material is removed evenly over the entire hull. A hard sanding of the hull follows this procedure.

The next phase of the repair is to dry the hull. It is our opinion that the vessel must be dried to a reading of less than 10 on an Electro physics moisture meter. With a low reading, only a minimal amount of moisture is trapped in the hull and a higher degree of secondary bonding between the original resin and the new material will occur. Some hulls dry very quickly after the peeling process. Others may be force dried with propane heat alternated with moving air.

If more than 80 mils of material had to be removed, the vessel will usually require a new laminate. OMC uses Knytex 1808dbm structural fabric for all re-laminations. This is a state of the art boatbuilding fabric which adds strength to the hull. Unlike chop strand matt, this fabric contains no WSMs. If less than 80 mils of material is removed, usually a barrier coating is all that is required. In either case, the hull is faired to original shape before the barrier coating is applied.

## FAIRING AFTER LAMINATE

OMC uses a Dow Chemical vinyl ester resin for both re-laminations and barrier coatings. This is a top of the line vinyl ester resin which is

considerably more expensive than commercial v.e. resin, and has excellent moisture barrier properties.

All OMC warranty barriers are applied to a thickness of 50 mils of vinyl ester resin. OMC gives a three year warranty to boats with barrier coat only, and a five year warranty with re-laminations. One coat of anti-fouling paint is included with both repair packages.

---